

Sean Casten, *Grist*

In the fall of 2003, I was at a barbeque in Vermont with a friend and former (Clinton-era) DOE official. The northeast blackout that August was still in the news, and I asked him whether he anticipated that it would lead to any policy reforms. His response was that during his tenure in D.C., the biggest challenge to smart energy policy was that with very rare exceptions, energy has never been an electoral issue. Those who seek elected office therefore find themselves personally disadvantaged if they allocate their limited educational time to understanding the nuances of our energy policy -- and we thus find ourselves with decades of energy policy, written by individuals who have consciously decided not to be energy experts. 2003 not being an election year, his prediction was that the biggest blackout in U.S. history would essentially lead to no substantive reform of U.S. electricity policy.

I was reminded of this conversation last month in a conversation with staff from Rep. Betty McCollum's (D-Minn.) office about the Thermal Renewable Energy and Efficiency Act (TREEA) that her office co-sponsored with Sens. Al Franken (D-Minn.) and Kit Bond (R-Mo.). The bill sets out a variety of incentives for district energy systems and has run into a consistent response of "distri-what?" as they have sought to rally broader Congressional support. District energy is a big deal and -- like most of our energy system -- subject to a host of regulations, many of which are inconsistent or in direct conflict with each other. Good policy would fix those inconsistencies, and the wisdom gleaned from a New England BBQ seems to be the primary obstacle thereto.

If you went to college or have ever been hospitalized, you have, in all likelihood been kept warm (or cool) by a district energy system. If you've ever lived in Paris, Manhattan, Philadelphia, Duluth, or Concord, N.H. (to name just a few), you've been equally dependent on district energy. District energy is also a big part of the reason why Denmark uses just half the fuel the U.S. does per dollar of GDP. But it's effectively invisible: taken for granted by its users and overlooked by its regulators. This leaves us with a really important part of the system that is particularly prone to lousy policy. It would be nice to find a way to fix that.

As Mighty Mouse says, here I come to save the day.

## **District energy 101**

District energy is nothing more than the piping of hot or cold water (or steam), such that a single

central boiler and/or chiller plant can take the place of lots of smaller ones at individual buildings. Hot or cold water doesn't have to move very far before it turns into room temperature water. As a result, district energy predominates in areas with a high-density of climate-controlled square footage -- urban areas, colleges, etc.

At its most basic level, the argument for district energy specifically is the argument for outsourcing generally: put energy experts at a central plant in charge of energy production and delivery so that you (as a building owner, retailer or other non-energy profession) don't have to.

On the other hand, the argument against district energy is its energy in efficiency. There's no significant difference in the energy efficiency of a big central boiler or a small local one -- but the central boiler must bear additional losses associated with the distribution (both to and from) the thermal user. The net result is that if a district energy plant burns fuel only to provide thermal energy, it's probably a bad idea.

This negative is fairly easy to overcome, however: add combined heat and power (CHP). Compared to the efficiency penalties innate to our electricity grid (which depends on the production of electricity hundreds of miles from urban centers), the efficiency penalties associated with moving a steam boiler a few blocks away from your home are trivial. The key to economically (and socially) beneficial district energy is therefore to build a thermally-matched CHP plant that is sized such that the waste heat from the power plant matches the thermal load of the district energy system. This approach has become nearly universal in Denmark, accounting for much of their reduction in energy use per unit of GDP.

Coupling CHP to a district energy system makes sense for three broad reasons: (1) the network effect facilitated by a diversity of thermal loads enhances capital utilization; (2) the economies of scale innate to larger generator installations reduces the capital cost per kW, and; (3) in some cases, a district steam plant with CHP can find it economically beneficial to add thermally-actuated chilling (using waste heat from the CHP unit), allowing year-round CHP operation and an additional revenue stream (typically, displacing an electric load from the grid).

Note that the benefit created by CHP derives in part from the additional value from electricity generation, but more generally from the use of otherwise wasted energy, which is a good idea regardless of whether it includes CHP. In any situation where district energy systems can be fueled with a "use it or lose it" energy stream, it can overcome the inefficiencies innate to the distribution system. Some facilities have accomplished this goal with the classic use-it-or-lose-it

stream: renewable energy. Cornell University takes advantages of thermal gradients in Lake Cayuga to run their district cooling system, and Reykjavik, Iceland relies on local geothermal resources for its district energy plant. Other systems have capitalized on industrial wastes: Gotenborg, Sweden runs their district energy system in part on waste heat recovered from a nearby oil refinery.

## **From the forest to the TREEA**

A few final comments on the TREEA are in order. The bill seeks to fix two oversights in our tax code that affect district energy:

1. It makes district energy plants eligible for tax-free bonds.
2. It allows renewably-produced thermal energy to be eligible for production tax credits.

The first is a good idea, long overdue. The second is directionally right, but ultimately flawed as a policy tool.

Access to tax-free bonds is as sensible as it has been overlooked. For decades, district energy systems have been eligible for tax-free municipal bonds, on the premise that they are providing urban infrastructure and ought to have access to the same pots of capital that fund roads, electric wires and all the other vital services on which a city depends. Unfortunately, the existing law only applies to the distribution network -- which is, of course, useless unless connected to a thermal-energy generation facility. I'm a firm believer in making our tax laws consistent with thermodynamic laws, and this change feels like a no-brainer.

The second provision strikes me as intellectually sloppy. If one is installing a renewably-fueled CHP plant, a tax-incentive applied exclusively to the electrical output of that facility clearly has the potential for unintended consequences, to the extent that it encourages a bias of the thermal/electric output of the facility away from maximum fuel efficiency and towards minimization of tax liability. So long as we are providing tax credits to incentivize renewable electricity generation, it makes all the sense in the world to provide an equivalent incentive for renewable thermal energy from a CHP plant. However -- for the reasons noted above -- it's not universally true that society is better off with district thermal energy (regardless of fuel source). Sometimes, local investments in low-emissivity glass/ground-source heat pumps/pellet stoves

are a better idea than central solar/geothermal/biomass thermal plants. And in all cases, the goal ought to be a reduction in fossil energy use, not necessarily a shift to a handful of sanctioned renewable fuels.

That criticism is probably a bit unfair though; as far as I can tell, the TREEA is an early draft bill, written not to be passed, but to start conversation that leads to another bill that will. Measured from that perspective, it's a great effort. Now let's continue the conversation.

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